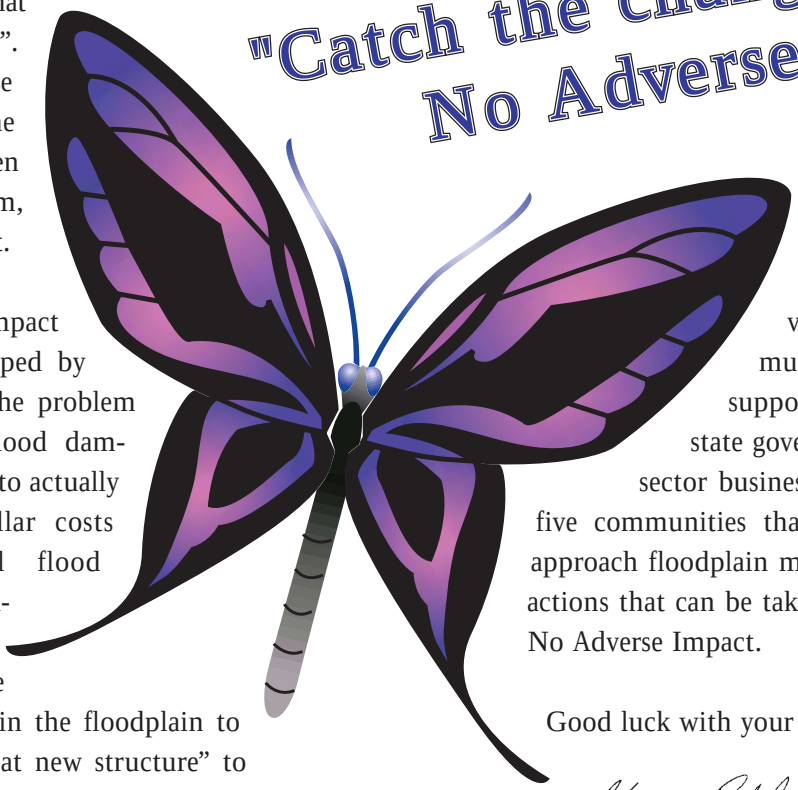
No Adverse Impact Status Report:

Helping Communities Implement NAI

June, 2002

Two years ago in Austin, Texas, the Association of State Floodplain Managers (ASFPM) first introduced the concept of No Adverse Impact (NAI) at the national conference. The reaction was mixed. There were immediate proponents, there were opponents, there were those that argued over the name, there were those that asked "how do we get there", and there were those that said "it's about time". Yet in spite of those mixed reactions, the NAI Initiative has been gaining momentum, definition and support.



The No Adverse Impact approach was developed by ASFPM to address the problem of ever increasing flood damages. If the nation is to actually reduce the real dollar costs of average annual flood damages, new approaches are needed. Those approaches must move from "how to build in the floodplain to reduce the risk to that new structure" to "what are the cumulative and sometimes secondary impacts of current and future development on other properties"? The NAI approach is developed with this in mind.

The reason NAI is gaining support is that people generally believe actions that transfer or worsen a flooding problem are not right. People also understand that these adverse impacts can be mitigated through a variety of tools. For those that are looking for the NAI blueprint – we hesitate to provide one, because an NAI management framework is one that reflects a specific community, and is not "one size fits all".

What we do provide is a framework of techniques, methods and tools that need to be examined for compatibility with each community's unique resources and conditions.

For NAI to flourish, the ASFPM is convinced that planning and implementation must begin at the local level. It should be supported by the programs and assistance of state government, federal government and private sector businesses. In this Status Report, we highlight five communities that have begun to adjust the way they approach floodplain management, and we provide community actions that can be taken in order to move towards the goal of No Adverse Impact.

Good luck with your efforts!

George Riedel

George Riedel, ASFPM Chair

Incorporating NAI Into Community Activities

As your community, state agency or federal program moves forward in building, planning and policy creation, consider incorporating the No Adverse Impact concept into your work. You can do this by making sure that the actions taken in the floodplain, and throughout the watershed, do not lead to adverse impacts on other property. Adverse impacts need to be mitigated to prevent transferring the problems to another property or community.

In This Issue...

To incorporate the No Adverse Impact concept, you should:
• define "adverse impact", based on your community's physical, environmental, social and economic condition;
•evaluate your hazards and programs, with the goal of lessening the impacts of actions on other property owners and communities;
•identify existing adverse impacts in the floodplain and throughout the watershed;
•use your resources to reduce or eliminate existing adverse impacts; and
•use your authorities to prevent new adverse impacts.

Below is a list of seven types of actions that your community undertakes in the normal course of business. Suggestions are included which you can incorporate as you do these day-to-day activities, thus moving your community toward the goal of No Adverse Impact.

Hazard Identification

While conducting any mapping project, think through the comprehensive approach. Mapping efforts should realistically reflect the existing hazards and the future impacts of development. Identify all flood related hazards, including hazards not normally identified by the minimum standards of the NFIP, such as dam failure, levee overtopping and channel migration. Include small watersheds, erosion and sedimentation among other considerations. Analyze how new development may have an impact, such as increased flood levels, and include the results of that analysis in the mapping project.

Planning

Local planning activities that you already undertake can easily incorporate the NAI concept. All local planning, including comprehensive, watershed, mitigation, housing, neighborhood, transportation, economic and capital improvement plans should recognize flood and flood related hazards. Review these plans in light of the individual and cumulative impacts on others, now and in the future, and recommend methods to prevent or mitigate adverse impacts. Likewise, hazard planning needs to consider and incorporate all of these other planning efforts.

Infrastructure (Public Works)

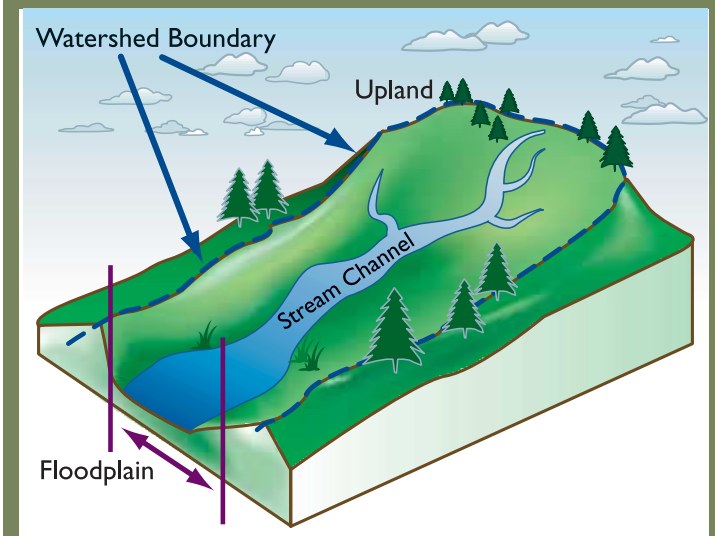
All actions to maintain, repair, replace and expand infrastructure (roads, utilities and public facilities) should include a review of the hazards, how the infrastructure can be protected from those hazards and the impact that the planned action may have on others. Providing infrastructure to a high risk area can influence whether the area gets developed or not. Again, any adverse impacts need to be mitigated while not transferring the problems to another property or community.

Emergency Services

Actions taken during and after a flood or other disaster should recognize adverse impacts. Adverse impacts need to be mitigated while not transferring the problems, such as increased flood heights or flood velocities, to another property or community. Flood warning and response activities should be pre-planned with accommodation for adverse impacts. For example, erecting a temporary levee during an emergency could have adverse impacts on others. Local emergency plans should identify alternative approaches, such as floodproofing, to protect property from flooding.

Regulations and Standards

Incorporate regulations and standards which prevent the adverse impacts of individual and cumulative impacts caused by current and future development. In order to protect existing and future development from the adverse impacts of new construction, regulatory policies, ordinances, standards and activities should prohibit development that causes adverse impacts. Standards should be set to evaluate the potential impact. For example, many communities require freeboard, where the first floor of new construction is placed a foot or two above today's flood level, recognizing that tomorrow's flood levels will be higher.



All land area in the watershed drains toward the stream channel; construction in any part of the watershed can impact other properties.

Corrective Actions

Take actions to correct existing hazards that were caused by past development and not transfer the problems to another property or community. Many of these actions, often called mitigation, can be accomplished after a disaster, using the disaster as impetus for change in how the community addresses it's hazards. Preventative actions can also be taken before a disaster hits, through planning and development/re-development activities. Consider all possible approaches, including elevation, acquisition, floodproofing and land treatments.

Education and Outreach

The community should convey the NAI message to specific target audiences. Target audiences can include members of the public, property owners, decision makers, design professionals and developers. Your message should be: know your community's hazards, understand how your actions could adversely impact others, make changes now to avoid legal consequences of actions that have an adverse impact on others and identify how community members can protect themselves and others. You probably have a variety of outreach programs and dissemination tools already in place; these can be modified to incorporate the NAI concept.

Watershed Development Ordinance in Lake County, Illinois

Summary of Techniques Used: Compensatory storage requirements, Depressional storage provisions, Detention on site required, Initial water quality treatment required on site, Release rates based on amount and duration of storm, Two foot freeboard, Flood Table Land elevation requirements match floodplain requirements, Mitigation for "isolated" wetlands, "Appropriate floodway uses" defined, Stringent water surface profile increase to define floodway, Stringent tolerances for hydraulic structures.

Vegetated swale helps to absorb floodwaters

Background: The County's vulnerability to flood damage became obvious with the floods of 1982, 1986, 1987, 1993, 1996 and 2000. Since 1982, Lake County has been declared a federal disaster area two times and a state disaster area six times. With the increase in population in the 1990's, the Lake County Stormwater Management Commission (SMC) worked with local municipalities on adopting minimum countywide standards for new development. Consequently, the Lake County Watershed Development Ordinance (WDO) was adopted in 1992 with major revisions in 1994 and 2001. The WDO contains several provisions that help the County achieve the No Adverse Impact approach. The WDO also contains several provisions to help prevent ordinance loopholes. In one example, the WDO considers a "site" to be the parcel that existed at the time the ordinance was adopted.

NAI Techniques and Methods Used:

- **Compensatory storage requirements:** Fill activities in the regulatory floodplain require the creation of compensatory storage to preserve floodplain storage volume. The WDO requires 1.2 cubic yards of compensatory storage, or excavation, for every 1.0 cubic yards of floodplain fill. Floodplain compensatory storage must be provided in a hydraulically equivalent manner. Fill volume placed below the 10% chance* flood elevation must be compensated below the 10% chance flood elevation just as fill placed between the 10% and the 1% chance* flood elevations must be compensated between those elevations.

- **Depressional storage provisions:** Depressional areas that would store greater than 0.75 acre-feet of runoff volume during a 1% chance flood are considered regulatory floodplain in Lake County. Fill activities in these areas require compensatory storage at a 1:1 ratio.

- **Detention on site required:** Detention is required for most development that will create greater than 0.5 acres of "new" impervious area on a site, and detention is required for all development that will create greater than 1.0 acres of "new" impervious area on a site. The amount of "new" impervious area for a site is cumulative from the date that the WDO was approved.

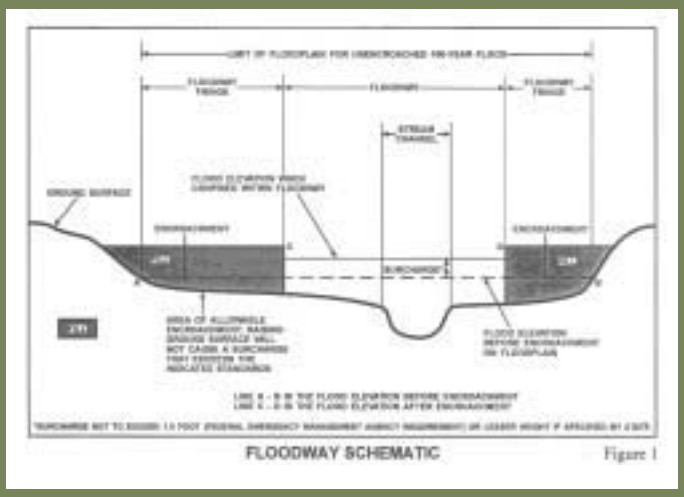
- **Adequate downstream capacity requirement:** Any concentrated discharge leaving a site must be conveyed in an existing channel, storm sewer or overland flow path with adequate downstream capacity to accommodate the runoff for storm events up to and including the 1% chance flood without increasing property damage.

- **Initial water quality treatment required on site:** The WDO attempts to limit the adverse impacts to water quality by requiring water quality treatment for the first portion of the developed site runoff. The requirement is based on the site's impervious percentage. The required treatment volume is equivalent to 0.01 inches of runoff for every 1% of impervious area multiplied by the site area. This applies to areas that create more than 0.5 acres of "new" impervious area at a site.

- **Release rates based on amount and duration of storm:** The WDO limits the peak discharge from a development site to 0.04 cubic feet per second per acre for the 50% chance* 24-hour storm event and 0.15 cubic feet per second per acre for the 1% chance 24-hour storm event. These release rates limit changes to the peak discharge in rivers and streams.

- **Two foot freeboard:** Structures built in the floodplain are required to have a lowest floor elevation that is at least 2 feet above the 1% chance flood recurrence interval elevation, the Base Flood Elevation (BFE).

- **Flood Table Lands elevation requirements match floodplain requirements:** The land located directly adjacent to the regulatory floodplain is considered "Flood Table Lands" if the ground elevation is within two feet of the BFE. The lowest floor elevation requirements also apply to structures constructed in the Flood Table Lands.



Allowable surcharge for defining the floodway

- **Mitigation for "isolated" wetlands:** The WDO recently added a requirement to mitigate impacts to "isolated" wetlands that exceed 0.25 acres. The mitigation ratio (typically 1.5:1) is 3:1 for impacts to high quality aquatic resources. Preservation of these areas and mitigation for impacts helps preserve storage, infiltration, evaporation and transpiration areas.

- **"Appropriate floodway uses" defined:** Only "Appropriate Uses" are allowed within the regulatory floodway. These uses are specified in the WDO and are limited to items such as: storm/sanitary sewer outfalls, underground or overhead utilities, playing fields and trail systems.

- **Stringent water surface profile increase to define floodway:** The allowable surcharge in the water surface profile for defining the floodway is 0.10 feet (See graphic above). The remaining floodway fringe, the area between the floodway and 1% chance floodplain boundaries, encompasses the portion of the floodplain that could be completely obstructed without increasing the water surface elevation of the 1% chance flood by more than 0.1 feet at any point.

- **Stringent tolerances for hydraulic structures:** A proposed hydraulic structure, whether new or a replacement, is not allowed to increase the upstream flood stages by greater than 0.1 foot for all flood events up to and including the 1% chance flood

Note:

*"1% chance flood or storm"= a flood or storm event that has a 1% chance of occurring or being exceeded in any given year. This is a replacement term for the "100 year flood or storm". The "10% chance" replaces the 10 year event. The "50% chance" replaces the 2 year event.

Economic Development and Responsible Floodplain Management

KineticPark in West Virginia

Summary of Techniques Used: Modification of bridge design that crosses the floodway, New FIS data, Acquisitions of floodplain properties, Detention in the floodplain, Culverts to eliminate water flow restriction, Vegetation and tree plantings to slow run-off.

View of KineticPark site from town with the highway in background

View of free span bridge under construction

Background: Cabell County and the City of Huntington, West Virginia have experienced a reduction in their skilled workforce over recent years. This decline has been primarily in the manufacturing sector and has created a void in higher paying skilled jobs, thus reducing the tax base in the area. The City of Huntington, in an effort to reverse this trend, has expended much time and dollars to attract high tech jobs to the region. Along with the Huntington Area Development Corporation (HADCO) it has attracted Amazon.Com and their East Coast Customer Service Center to KineticPark. Amazon.Com will create over 375 jobs with an annual payroll of over $7,000,000. The city tax base will be increased with the additional Business and Occupational tax based on gross revenue. Several additional high tech organizations have expressed interest in locating in the park.

Project Description: The development cost of KineticPark is estimated at $15,000,000, with site preparation costing over $7,000,000. This excessive cost for site preparation (100 acres) is primarily because a large portion of this development is in the City of Huntington's regulatory floodplain.

Recognizing the sensitivity and potential complications of such development, the city has gone to great lengths to make sure that this new development (1)will have no adverse impact on its community or its standing in the National Flood Insurance Program (NFIP) and (2)exemplifies best practices for Economic Development and Responsible Floodplain Development.

NAI Techniques and Methods Used:

- **Change to free span bridge to cross the floodway; Cost $2,050,000:** West Virginia Department of Highways has designed and will build an elevated precast concrete bridge that spans the entire regulatory floodplain at the 0.2% chance* flood elevation. This bridge will be the main entrance into KineticPark. The original design included an earthen berm within the floodway.

- **New FIS data; Cost $113,000:** The City of Huntington, Cabell County Commission, Enslow Park Neighborhood Association, Fourpole Creek Task Force, Economic Development Administration , FEMA, Project Impact, and the Huntington District Corps of Engineers partnered to fund a new Fourpole Creek Watershed Flood Insurance Study. The City of Huntington enacted an ordinance in November of 1999, that stated that KineticPark will include the new Base Flood Elevations (BFE), as a result of this Flood Insurance Study (FIS), in the final construction phase. The new FIS data is critical because change has occurred since the original FIS in 1980 and increases in land use have increased the BFE. New, more accurate BFEs are critical in helping to determine how a specific development will impact adjacent property owners.

Entry Perspective, KineticPark

- **Acquisitions of floodplain properties, detention in the floodplain, and culverts to eliminate water flow restriction; Cost $ 1,250,000:** Within the Fourpole Creek Watershed and adjacent to KineticPark, the West Virginia Department of Highways will be expanding State Route 10 to four lanes. This new road construction would not have included mitigation measures to lessen the impact of run-off. However, the Department of Highways, in an effort to ensure responsible floodplain development techniques, will include acquisitions of properties in the floodplain, detention in the floodplain, and extensive box culverts, where needed, to eliminate any restriction of water flow in the floodplain.

- **Vegetation and tree plantings to slow run-off; Cost $120,000:** The Huntington Empowerment Zone will fund land use mitigation measures in the form of vegetation and tree plantings throughout KineticPark to contain some storm water run-off.

- **Detention and impoundment structure; Cost $235,000:** The final site phase of construction includes two detention ponds and an impoundment structure to collect stormwater run-off. This will create compensatory storage for run-off from new parking areas.

Site Perspective, KineticPark

Helpful Hints for Success:

Partnership and networking with federal, state and local agencies as well as private business and the general public is a key element in building stakeholders and establishing sustainable relationships throughout the community. These various groups have learned that working together will enhance projects and make them more responsible, therefore more cost effective in the long run.

Note:

*"1% chance" = a flood event that has a 1% chance of occurring or being exceeded in any given year. This is a replacement term for the "100 year flood". The "0.2% chance" replaces the 500 year flood event.

Ordinances and Greenway Program Arnold, Missouri

Summary of Techniques Used: Stringent Storm Water Ordinance includes requirements for buffer area, stringent erosion control enforcement, prohibition of enclosing creeks; Comprehensive Greenway Plan and Acquisition Program; Floodplain Ordinance requires three foot freeboard; Definition of "Appropriate Uses" in Zoning Ordinance.

Open Space at flood stage, Meramec River

Background: Since the early 1980's the Meramec River has flooded many times resulting in three presidential disaster declarations for the City of Arnold. As early as 1975, the city started taking action to protect its citizens and properties with the passage of a floodplain ordinance. Because the community took numerous actions over the years to make changes, flood-fighting costs are now drastically reduced because there are not as many structures in harm's way. A 20% chance* flood event currently results in only a few structures being flooded. With a 10% chance* flood event only three more structures would be effected and with a 1% chance* flood event 40 structures would be impacted.

The City of Arnold has participated in the National Flood Insurance Program (NFIP) since 1972 and is currently rated as a Class 5 community in the NFIP Community Rating System (CRS).

NAI Techniques and Methods Used:

- **Ordinance requires buffer, stringent erosion control enforcement and prohibition of enclosing creeks:** The Storm Water Management Ordinance requires that all new development that increases runoff by more than two cubic feet per second must be detained on site. In addition, the runoff rate at the discharge location must be the same as it was prior to development.

  The ordinance establishes a buffer zone, Storm Water Management Easement Area, from the elevation at the top of the riverbank to the elevation one foot above the bank. This area needs to be set aside as open space for recreation and other appropriate open space uses.

  For new development, the ordinance requires a grading permit that must identify the erosion control measures that will be used to keep the soil from leaving the site. Examples would include hay bale or silt fencing. For new development, the ordinance also requires re-vegetation within four months to control sedimentation in the surface water. Examples of re-vegetation techniques would include hydro seeding, seed and straw. The design for these erosion and sediment control techniques is dependent on the topography, soil type and other site specific factors.

  In addition, the ordinance prohibits enclosing creeks. By prohibiting this activity, all of the natural and beneficial functions of the floodplain are maintained. These benefits include floodwater storage, erosion control, improved water quality, recreational opportunities and preservation of habitat.

- **Comprehensive Greenway Plan includes acquisition program:** As part of a CRS requirement, the City passed a resolution adopting a Comprehensive Greenway Plan, addressing management of floodplain acreage. Because 23% of the land area of the City of Arnold is within the floodplain, management of this acreage is a high priority to the entire community. The City wanted to turn this substantial area into a resource for the community.

  In the 1980's, the City of Arnold was one of the pilot communities for US Army Corps of Engineers and NFIP acquisition funding. Since that time over 600 residential and commercial structures have been acquired and removed from the floodplain.

  Although the Comprehensive Greenway Plan identifies trails and other appropriate uses in the floodplain, construction has not yet started due to funding constraints. However, the property has been acquired and is dedicated as open space. The City owns most of the open space and some, owned by private individuals, is deed restricted as open space.

Arnold Meramec River Greenway Master Plan Concept

- **Floodplain Ordinance more stringent than NFIP minimum standards:** Floodproofing for new construction must be three feet above the Base Flood Elevation (BFE). It requires that the primary access be above the 1% chance flood event elevation.

- **Zoning Ordinance defines "Appropriate Uses":** The ordinance defines floodplain as "land along the watercourse of the Mississippi and Meramec Rivers and their tributary streams for which hydrographic study and calculations indicates a risk to life and property as a consequence of stormwater runoff". Permitted land uses and developments in the floodplain include farming, forests, public parks, parkways, scenic areas, wildlife refuges, golf courses, public and private non-commercial picnic grounds, swimming pools, boat docks, underground and above ground public utility transmission lines, fishing, propagation of wildlife, off-street automobile parking, residential yards, non-residential farm buildings, agricultural operations, accessory buildings and churches.

Note:

*"1% chance flood event" = a flood event that has a 1% chance of occurring or being exceeded in any given year. This is a replacement term for the "100 year flood". The "10% chance" replaces the 10 year flood event. The "20% chance" replaces the 5 year flood event.

Holistic Stormwater Management Fort Collins, Colorado

Summary of Techniques Used: Floodplain Regulations include no floodway or corridor modifications, no floodway redevelopment, no variances in the 0.2% chance* corridor, two foot floodproofing freeboard; Floodplain Property Acquisition Program as part of regulations; Capital Improvement Program includes Drainage Way Master Plan and $120 million in stormwater improvements within 25 years.

Poudre River to be enhanced.

Background: After the City of Fort Collins experienced deadly flooding in 1997, the City reviewed the stormwater management program. For the City of Fort Collins, the primary goal of stormwater management is to be proactive instead of reactive in managing the effects of flooding.

The main purposes of the flood hazard mitigation program are: promoting public health/safety/general welfare, reducing public and private losses, reducing emergency response demands, minimizing pollution and preserving the natural and beneficial functions of the floodplain or river corridor. The City has a four part mitigation approach: floodplain regulations, acquisition of floodplain property, capital improvements and emergency response.

The first basin to complete a review of its floodplain regulations was the Cache la Poudre River (Poudre River) due to its potential impact to the community. The history of flooding on the Poudre River is well documented; it was the flood of 1864 that caused the relocation of Camp Collins to the present day Fort Collins. The outcome of the review generated restrictive floodplain regulations for the Poudre River that will reduce the exposure to flood hazards along the river corridor.

NAI Techniques and Methods Used:

- **Floodplain Regulations include no floodway or corridor modifications, no floodway redevelopment, no variances in the 0.2% chance* corridor, two foot floodproofing freeboard:** Poudre River regulations go beyond the minimum NFIP standards. Specific examples are described below.
  - A 0.1 foot rise floodway.
  - The corridor is defined as the 0.2% chance flood zone which has a velocity times depth greater than or equal to 6.
  - Neither the corridor nor the floodway can have development or encroachments.
  - No fill is allowed in the floodway or corridor. Fill is permitted in the floodplain fringe. Property can be removed from the floodplain fringe with the placement of fill; it must comply with freeboard, dry land access and floatable materials regulations (and possibly the CLOMR-LOMR process).
  - New development is not allowed in the floodway or corridor, except public infrastructure, recreation and natural resources facilities. New development is permitted in the floodplain fringe.
  - Manufactured Home Parks and residential development are not allowed in the floodway, floodplain fringe or corridor.
  - Commercial development is not allowed in the floodway or corridor, but is permitted in the floodplain fringe.

- Remodels are allowed in the floodway, floodplain fringe and corridor, however 50% cumulative substantial improvement triggers the application of floodplain regulations for new structures. Residential additions are not allowed to existing structures in the floodway, corridor or floodplain.
- Redevelopment (removing and rebuilding) is not allowed in existing developed areas in the floodway or corridor, but is allowed in the floodplain fringe.
- Critical facilities are not allowed in the 0.2% or 1% chance* floodplain. Dry land access is required for property outside the 1% chance floodplain.
- Dry land access to floodplain property is not allowed in the floodway, floodplain fringe or corridor.
- Variances are allowed for special circumstances, however, no variances are granted in the corridor.
- Floodproofing is required to 24 inches above the 1% chance floodplain; this applies to substantial improvement remodels, new development or redevelopment and additions.

Poudre River to be preserved.

- **Floodplain Property Acquisition Program as part of regulations:** To mitigate the effects of flooding, the City initiated the acquisition of properties along the Poudre River floodplain. The City's Stormwater Utility or Natural Resources Department can acquire floodplain property on a "willing seller – willing buyer" basis. Residential floodway and corridor properties are the priority. Properties with the highest risk receive the highest priority for acquisition. Once acquired the structures are removed, the lot is re-vegetated and turned into permanent open space.

- **Capital Improvement Program includes Drainage Way Master Plan and $120 million stormwater improvements within 25 years:** The City is currently developing a drainage way master plan than will identify cost-effective measures that will complement the other mitigation measures. This drainage way master plan will address stability of the river in general and major flood damage areas in particular. Completion of the master plan is scheduled for the winter of 2002-2003. The City has recently initiated an aggressive citywide stormwater capital improvements program to complete $120 million in improvements in 25 years.

- **Emergency Response includes citywide gauging, notification and regular training exercises:** There is a citywide rain and stream gauging system that detects and locates flooding in real time throughout Fort Collins. Other components dedicated to emergency response and notification include: an AM radio station, a cable TV override system, an auto dialer, a web site, a National Disaster Information Card System for Dispatching, weather information through Emergency Managers Weather Information Network and regularly scheduled training exercises of emergency response personnel.

Note:

*"1% chance" = a flood event that has a 1% chance of occurring or being exceeded in any given year. This is a replacement term for the "100 year flood". The "0.2% chance" replaces the 500 year event.

New Stormwater Controls in Washington State

Summary of Techniques Used: Infiltration as preferred management option, Flow control requirement is based on duration, Regional specific hydrology model is used for analysis, Post-development discharge durations can not exceed the pre-development.

Urban stormwater, part of the problem

Background: In August 2001, the Washington State Department of Ecology published the Stormwater Management Manual for Western Washington. The Manual provides guidance for the 19 western Washington counties on the measures necessary to control the quantity and quality of stormwater produced by new development and redevelopment. The provisions identified in the Manual are specifically applicable to the relatively wet climate on the west side of the Cascade Mountains. A similar manual for the drier climate in eastern Washington is scheduled for completion in early 2003 and will contain provisions that are applicable to the 20 counties in eastern Washington.

Implementation of the provisions in the Manual is through local governments, since the Manual has no independent regulatory authority. The provisions in the Manual become requirements through ordinances and rules established by local governments and through conditions in permits or other authorizations issued by local, state and federal authorities. The majority of larger communities in western Washington will be required to adopt the Manual provisions. Communities may be subject to the Manual provisions either by being located in the Puget Sound Basin or being designated as a Phase I or Phase II municipality subject to the National Pollutant Discharge Elimination System (NPDES) municipal stormwater permitting requirements.

Even though many of the adverse impacts of stormwater are water quality related, the increased flows due to stormwater runoff often are a large contributor to flooding problems, not only on the development site, but also in the stream channels downstream. The Stormwater Management Manual for Western Washington contains many provisions related to water quantity and quality and the means of reducing adverse impacts through the application of Best Management Practices (BMPs). BMPs are identified for source control, treatment control and flow control.

NAI Techniques and Methods Used:

- **Infiltration is preferred management option;** Infiltration of stormwater is the preferred stormwater management option, but is only available in porous soils and where there will not be any adverse impacts to ground water quality.

- **Flow control requirement based on duration:** The Manual's primary means of controlling stormwater flows is the requirement that flow control facilities must be provided when certain thresholds for the size of a project are exceeded, or if there is a calculated increase of 0.1 cubic feet per second or more in the 1% chance* storm event frequency. This new flow control requirement is based on flow duration, instead of the more common standard of controlling the peak instantaneous flow. In most instances controlling the flow duration also controls the peak instantaneous flow. The standard prevents increases in the total amount of time that erosion-causing flow rates exist within the stream channels.

- **Regional specific hydrology model is used for analysis:** The Washington Department of Ecology has developed a rainfall-runoff model called the Western Washington Hydrology Model for making the calculations related to the flow control standard. Various design configurations for a specific project are developed, with the model being run to simulate the post-developed condition so that the numbers of hours for the same range of flows do not exceed any of the corresponding flow durations for the pre-developed condition.

- **Post-development discharge durations can not exceed the pre-development durations, not the existing condition at the time a project is developed:** The flow duration standard is based on preventing increases in the stream channel erosion rates that are characteristic of natural conditions. The standard is that post-development stormwater discharge durations from a project shall not exceed the pre-development durations. The pre-development condition for which runoff durations must be matched is forested land cover, regardless of what the existing land cover is at the time the project is proposed for construction. If historic information can be provided which shows the site was grassland, instead of forest, prior to settlement, then the pre-development condition to be matched can be considered grassland or pasture, instead of forest. With the requirement to match the pre-development condition instead of the existing condition at the time a project is developed, runoff from the post-development condition in many cases would actually be less than runoff from the site just prior to the development. A project site can be exempted from this requirement if it can be designed so that all the runoff from all the impervious surfaces and converted pervious surfaces on the site can be infiltrated into the ground.

Stormwater Treatment/Retention Pond, part of the solution

Since the post-development flow durations can not exceed the pre-development (natural conditions) flow durations, implementation of the provisions of the Manual by local governments, will truly result in a No Adverse Impact condition related to stormwater runoff for new development and redevelopment in western Washington.

Note:

*"1% chance storm event" = a storm event that has a 1% chance of occurring or being exceeded in any given year. This is a replacement term for the "100 year storm".

Contact Information

Watershed Development Ordinance Lake County, Illinois

On-line Watershed Development Ordinance available at:
http://www.co.lake.il.us/smc/wdo/wdodoc.pdf

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Stormwater Manual for Western Washington State

On-line Manual available at:
http://www.ecy.wa.gov/programs/wq/stormwater/index.html

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The ASFPM wishes to thank the following sponsors for their generous support of the NAI Initiative;

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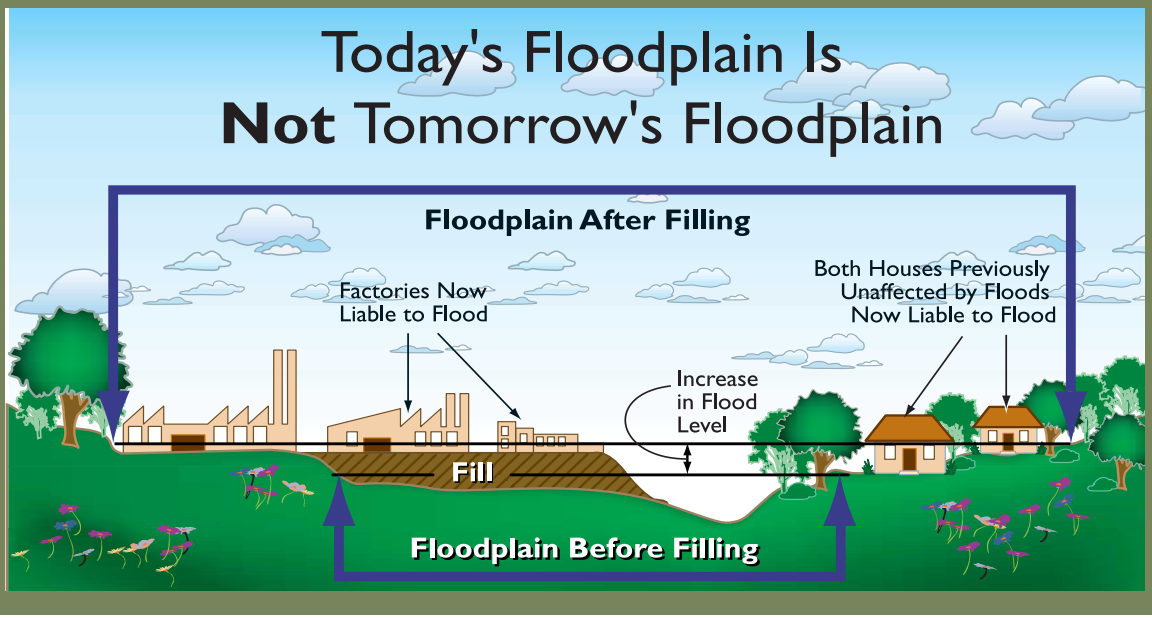

If large areas of the floodplain are filled or large portions of the watershed are developed, then there will be an increase in the land area needed to store flood waters. This means your home or business may be impacted.

What's next for the NAI Initiative?

If your community is implementing activities that support the NAI Initiative, please contact ASFPM so that we can get your information included in the next Status Report.

To learn more about the NAI Initiative, contact the ASFPM directly or access our WebSite for NAI reference materials:

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